

# Fingers to feminism: the rise of 2D:4D

GLENN D. WILSON *charts the rise of a new sociobiological insight*

**I**n the last decade there has been an explosion of research using digit ratio (2D:4D) as a biomarker of prenatal testosterone. Hundreds of papers have been published (at least 30 in the last year) which use this index to reveal weird and wonderful associations with an array of behavioural traits. A special issue of *Personality and Individual Differences* devoted to digit ratio is currently in preparation. Here I describe how the index originated out of a lively debate about the origins of sex differences in the pages of *The Psychologist*, then known as *The BPS Bulletin*, around three decades ago.

In the 1970s I was confronting a radical brand of feminism that seemed to assume that equality depended upon identity. Their claim was that men and women are much the same under the skin and the manifest psychological differences were mainly due to upbringing and social role learning. It was therefore the duty of “society” to “engineer” them away. Hans Eysenck and I were among those who believed in the existence of fundamental, evolved sex differences, rooted in genes and prenatal hormones, which could not easily be dismantled by “society” (Wilson, 1979). Feelings ran high and some of our own female colleagues were outspoken in their hostility. One wrote that my suggestion that women were naturally picky about their partners was just “an apologia for personal rejection”. An American woman accused me of “furthering a personal belief concerning social conduct of the sexes” and trying to “justify and maintain social custom concerning differential treatment of the sexes” (Biaggio, 1982). Others analysed the grammar and vocabulary by which I sought, cunningly, to persuade readers of the veracity of my viewpoint (Watkins, 1980). Understandably, I was on the lookout for

evidence to confirm the idea that sex differences were biologically based.

In 1977 (together with Mark Cook) I organised an *International Conference on Love and Attraction* at Swansea University in Wales. In a keynote address, Eysenck (1979) argued for the importance of biologically based individual differences in sexual behaviour. He described the work of a German physician, W.S. Schlegel, who had latched onto pelvic shape as an indicator of prenatal hormone influences. Females, being designed for childbirth more than running, tend to have a broader pelvic outlet than males, but there is considerable variation within sex. Schlegel (1975) showed that men and women with pelvic shapes atypical of their sex were more likely to display cross-gendered behavioural traits and had a higher divorce rate than sex-congruent individuals. He also observed that lesbian cows (those that made a practice of mounting other cows) had a more masculine pelvic shape than other cows. Schlegel apparently upset his students so much that they invaded his lectures and successfully pressed for his dismissal from his university appointment in constitutional medicine.

At the risk of similar treatment, I decided to take up this line of research at the Institute of Psychiatry in London. Initially I sought to replicate Schlegel's findings that pelvic shape predicted masculinity-femininity of personality and marital stability. In a study published after some delay (Wilson & Reading, 1989), it was confirmed that women who were "feminine" (and "non-feminist") on an attitude questionnaire had a broader pelvis and were more sexually satisfied than masculine/feminist women. But there had been a problem. Schlegel had used X-rays to measure pelvic shape but we considered this ethically dubious because of the risk of genetic damage. Hence we used assessments based on the physical examination of a Consultant Gynaecologist during routine obstetric examinations. These were of necessity approximations and, since all our subjects were pregnant women, the variance was restricted and the effect size low.

Because pelvic shape was turning out to be an intrusive and impractical index for individual differences research, I decided to look for a skeletal marker of sex that would be more accessible and more easily assessed. I recalled a study Phelps (1952), noting the curious fact that men tended to have a shorter index finger relative to the ring finger, while for women this was reversed. This sex difference was apparently stable from birth and was presumed to be genetic. It seemed to me that the digit ratio might be a biomarker of prenatal sex hormone exposure, so it would be interesting to see if it was associated with sex-typical personality traits.

The opportunity to collect some data to test this idea came when I was asked by the *Daily Express* to advise on a survey of “changing attitudes of women in the 1980s”. The editor kindly allowed me to insert two questions of my own that addressed the issue. One asked respondents to classify themselves as “gentle and feminine”, “assertive and competitive”, or “fairly average” by comparison with other women. The other (in a different part of the questionnaire) asked them to measure, in centimetres, the length of each finger on their left hand “from the lower wrinkle to the tip excluding fingernails”. They were told “there is an interesting reason for this which will be explained later”. Nearly a thousand female readers of the newspaper returned questionnaires and the results revealed a small but significant tendency for women with low 2D:4D ratios to describe themselves as “assertive and competitive” (putative testosterone related personality traits). I concluded that this “could reflect the simultaneous effect of prenatal hormones on body and brain” (Wilson, 1983).

It occurs to me that it would be very difficult to do this kind of study today. If I had sought formal ethical clearance, completing the monumental (111 page) application form, I would have missed the window of opportunity for data collection. Permission would probably have been declined anyway, since committees were taking it upon themselves to evaluate the scientific worth of proposed studies as well as adjudicating ethical issues, and they would no doubt have deemed this trivial. I cannot imagine what funding body would want to support such research so no research assistance would be forthcoming. Furthermore, the findings would probably not have seen the light of publication were it not for the fact that Hans Eysenck himself was virtually the sole arbiter of what went into PAID at the time. He saw it as his own journal and was suspicious of referees, who he felt often rejected manuscripts on technicalities, while missing the broad originality of the ideas contained in them. Many of my colleagues were dismissive of my study but Hans thought it intriguing and put it forward for immediate publication.

Naturally, with its phrenological overtones, the media had a field day reporting the finding. People around the nation were exhorted to forget personality tests and discover their “true self” by applying rulers to their fingers (the usual media over-reaction, especially given the marginal significance of the results). I was therefore surprised that, when I met John Manning during the filming of a BBC documentary, he told me he was unaware of my study before commencing his own programme of research on digit ratios some 15 years later. I fully accept his word on this, and it is

perfectly credible. After all, neither of us were aware of the work of Hans-Dieter Rosler in 1950s Germany, anticipating us both in many respects and which has only just come to light (Voracek, Dressler & Loibl, 2008). Also, Manning was not deliberately overlooking my study; indeed he had described it in detail in his first, very influential book (Manning, 2002).

I am both astonished and delighted by the extent to which research on 2D:4D has caught on after Manning, Breedlove and others took it up in the last decade. Among the many factors that it has been connected with are spatial ability, sporting success, musical prowess, success in financial trading, traffic violations, fertility and sexual orientation (all of which may be found in a dedicated website).

I have wondered whether there might be more obvious gender markers that could be substituted, such as height. Of course, the reason I chose not to use height in the first place is that it is so obvious that critics would have objected that any connections with personality might be mediated by the social impact of being tall (tall people becoming assertive and dominant because of their impressive stature). Finger ratios are much less noticeable and unlikely to be the “cause” of the personality traits associated with them. Still, some have argued that the height factor should be partialled out before the effect of digit ratios is examined, despite minimal correlations between height and 2D:4D (Manning, Scutt, Wilson & Lewis-Jones, 1998).

Voice pitch is another biological trait that differentiates the sexes and I explored this in relation to the personality and behaviour of opera singers of various voice categories (Wilson, 1984). In accord with expectation, lower voiced singers (basses, baritones, contraltos and mezzo-sopranos) turned out to be more emotionally stable and sexually predatory than higher voiced singers (tenors and sopranos), traits typical of men and women respectively. Voice pitch has been taken up by other researchers as a biomarker of sex hormones, but the same problem applies; deep voices might predict masculine personality traits because they sound more authoritative and impressive than high voices. Digit ratio is relatively free of such counter interpretations.

There are justifiable concerns about the reliability of the digit ratio. Although it fairly consistently separates men from women in group data, correlations with target variables are often low, sometimes non-existent (Voracek, Manning & Dressler, 2007). Indeed, the personality trait of assertiveness that I first studied in relation to digit ratio has proven to be a particularly poor correlate (Voracek, 2009). Putz et al (2004) point out that whether or not a sex dependent trait correlates with digit ratio might

depend on the timing of sexual differentiation during uterine development. Establishing such timetables may turn out to be an important application of 2D:4D; traits that correlate with digit ratios are presumably differentiated at around the same time.

The findings concerning sexual orientation are particularly complex. Although some researchers have found cross-gender digit ratios in gay men (McFadden & Shubel, 2002), many others have not. In fact, the consensus is that the peripheral body traits of homosexual men suggest exposure to more, not insufficient, testosterone (Wilson & Rahman, 2005; Voracek, Manning & Ponocny, 2005). This little surprise, revealed by finger ratio research, among



CHARLES NEGRE, 1851

other indices such as penis size and male-pattern baldness, might lead to important developments in theory concerning the origins of sex orientation. It seems to support a brain module interpretation of homosexuality, as against the simple-minded idea that gay men are generally effeminate. Transsexualism seems to relate to a different brain module; male to female transsexuals have a female-typical finger ratio (Schneider, Pickel & Stalla, 2006). Digit ratio may also be useful in distinguishing what is genetic from what is due to early environment. For example, Hall and Love (2003) found that when female MZ twins were discordant for sexuality the lesbian twin had a lower (more masculine) 2D:4D ratio. Because MZ twins share the same genes, their

discordant sexuality must be down to some aspect of the environment and the digit ratio finding suggests that prenatal hormones at least contribute.

Autism is another interesting target for digit ratio research. When I reviewed Simon Baron-Cohen's first book on autism (*Mindblindness*) I took him to task for avoiding discussion of sex differences (Wilson, 1996). Since the most outstanding fact about autism is its largely male incidence, this seemed to me an important omission. I went on to suggest that autism might be construed as "the convergence of mental handicap with a hypermale skills profile", an idea previously mooted in my book *The Great Sex Divide* (Wilson, 1989). This "extreme male brain theory" of autism has since become a major plank in Simon's theory and he has found digit-ratio to be a convenient and accessible testosterone marker (Baron-Cohen, 2003).

As with any field of research, there are many unanswered questions with respect to digit ratios. Does it matter whether measurements are taken on the right or left hand? In my own study I used the women's left hand so their right would be free to make the measurements, but the right hand may produce more significant results (Manning et al, 1998). Some researchers fail to mention which hand was used or they confuse left and right because the photocopy is a mirror image (Voracek, et al, 2007). There may even be some value in calculating the degree of difference between left and right hand digit ratios, since it bears on the issue of "developmental instability". Is there a parallel difference in the toes? There is some evidence that this is the case (McFadden & Shubel, 2002), so the relative predictive power of hands and feet could be investigated. Are there any other digit comparisons (using fingers other than 2 and 4) that might be as good or better? Current indications are that the 2D:4D is the best of the digit comparisons (showing the greatest effect size) though others may come close (McFadden & Schubel, 2002).

We also need to ask what is the evolutionary function of the sex difference. Is the stubby forefinger of males better in opposition to the thumb for tool use, or weapon throwing, or stronger and less vulnerable to being broken? Does the female pattern have some advantage for female specialised tasks, like ancestral berry picking? The early work of Han-Dieter Rosler suggested that female-typical hands were associated with occupations requiring manual dexterity, while male-typical hands were over-represented in manual workers. Sex differentiation does not usually occur without some good reason but it is not obvious at present what that reason might be. Cross-species studies of the 2D:4D index may be informative in tracing its evolutionary origins and such studies are now being done.

We have come a long way since those days when many feminists were hostile to the idea of biologically based sex differences. Most now accept, even celebrate, fundamental sex differences and recognise that their (thoroughly legitimate) cause is moral and political rather than scientific. In recent years evolutionary psychology has gained widespread acceptance as a discipline, with most introductory psychology texts including a chapter on it. In these senses, the battle played out in the pages of *The Psychologist* all those years ago has been largely won. In addition, I believe that the digit ratio (2D:4D) has proven a useful tool, not just in demonstrating that uterine sex hormones exert an influence on human behaviour as well as body morphology, but in helping to tag more precisely the phase in prenatal development at which various psychological traits are differentiated. ■

GLENND WILSON PhD, FBPsS is Visiting Professor of Psychology at Gresham College, London and was previously Reader in Personality at the Institute of Psychiatry, King's College, London. His website is [www.drglennwilson.com](http://www.drglennwilson.com)

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